7-02 CULVERTS

7-02.1 Description

This Work consists of constructing culverts of the various types and classes in accordance with the Plans, these Specifications, and the Standard Plans, at the locations staked.

Culverts may be used for transverse drains under the Roadway or as conduits for water pipe or other utilities passing under the Roadway.

7-02.2 Materials

Materials shall meet the requirements of the following sections:

Plain Concrete Culvert Pipe	9-05.3(1)
Reinforced Concrete Culvert Pipe	9-05.3(2)
Beveled Concrete End Sections	9-05.3(3)
Steel Culvert Pipe and Pipe Arch	9-05.4
Steel Nestable Pipe and Pipe Arch	9-05.4(8)
Steel End Sections	9-05.4(9)
Aluminum Culvert Pipe	9-05.5
Aluminum End Sections	9-05.5(6)
Solid Wall PVC Culvert Pipe	9-05.12(1)
Profile Wall PVC Culvert Pipe	9-05.12(2)
Corrugated Polyethylene Culvert Pipe	9-05.19

Where steel or aluminum are referred to in this Section in regard to a kind of culvert pipe, pipe arch, or end sections, it shall be understood that steel is zinc coated (galvanized) or aluminum coated (aluminized) corrugated iron or steel, and aluminum is corrugated aluminum alloy as specified in Sections 9-05.4 and 9-05.5.

Thermoplastic culvert pipe includes solid wall PVC culvert pipe, profile wall PVC culvert pipe, and corrugated polyethylene culvert pipe. Solid wall PVC culvert pipe and profile wall PVC culvert pipe are acceptable alternates for Schedule A or B culvert pipe. Corrugated polyethylene culvert pipe is an acceptable alternate for Schedule A culvert pipe.

It is not necessary that all culvert pipe on any one project be of the same kind of material. However, all contiguous pipe shall be of the same size, material, thickness, class, and treatment and shall be that required for the maximum height of cover.

Measurement for payment of the Bid items associated with the drainage installation will be based on the diameter of the culvert pipe described by the Bid item in the Proposal.

When schedule A, B, C, or D culvert pipe is specified in the Plans, the Contractor shall provide the specified schedule and diameter but has the option of furnishing any of the acceptable materials shown in the Culvert Pipe Schedules Table.

The use of tongue and groove concrete pipe shall only be allowed under side road connections. All tongue and groove pipe shall be joined with cement mortar.

Culvert Pipe Schedules

Schedule (Fill Height)	Diameter in Inches	Concrete	Steel 2⅔" x ½"	Aluminum 2⅔" x ½"	Thermoplastic PE[1] or PVC[2]
A 2' - 15'	12, 18, 24	Plain or Cl. IV	.064" (16 Ga.)	.060" (16 Ga.)	PE or PVC
	30, 36	Class III	.064" (16 Ga.)	.075" (14 Ga.)	PE or PVC
	42, 48	Class III	.064" (16 Ga.)	.105" (12 Ga.)	PE or PVC
B 15' - 25'	12, 18, 24	Class V	.064" (16 Ga.)	.060" (16 Ga.)	PVC
	30, 36	Class V	.064" (16 Ga.)	.075" (14 Ga.)	PVC
	42, 48	Class V	.064" (16 Ga.)	.105" (12 Ga.)	PVC
C 25' - 40'	12, 18, 24	None	.064" (16 Ga.)	.060" (16 Ga.)	None
	30, 36	None	.064" (16 Ga.)	.075" (14 Ga.)	None
	42, 48	None	.064" (16 Ga.)	.105" (12 Ga.)	None
D 40' - 60'	12, 18	None	.064" (16 Ga.)	.060" (16 Ga.)	None
	24	None	.064" (16 Ga.)	.075" (14 Ga.)	None
	30, 36	None	.064" (16 Ga.)	.105" (12 Ga.)	None
	42, 48	None	.079" (14 Ga.)	.135" (10 Ga.)	None

1. Corrugated polyethylene pipe.
2. Polyvinyl chloride pipe. Solid wall or profile wall for diameters through 27-inches. Profile wall for diameters larger than 27-inches

7-02.3 Construction Requirements

Culverts shall be constructed in accordance with Section 7-08.3.

7-02.3(1) Placing Culvert Pipe — General

A dike or plug of impervious material shall be placed near the intake end of the culvert to prevent piping. The dike shall be 2-feet long and adequately surround the pipe to form an impervious barrier. When suitable impervious materials are not available at the site, suitable backfill shall be obtained as provided in Section 2-09.3(1)E.

The ends of the pipe or pipe arch shall be rigidly supported to prevent movement before and during the construction of end walls or headers.

Culverts shall not be left extending beyond the staked limits unless approved by the Engineer.

All thermoplastic pipe shall be beveled to match the embankment or ditch slope but shall not be beveled flatter than 4:1. The minimum length of each section of pipe that is to be beveled shall be at least 6 times the diameter of the pipe when measured from the toe of the bevel to the joint.

7-02.3(2) Installation of Metal End Sections

Metal end sections shall be installed in accordance with the requirements of the Standard Plans, the Plans, and applicable portions of these Specifications.

When flared metal end sections are installed on concrete pipe, Design B end sections will be used on the inlet end only. Design C end sections will be used on the outlet ends only according to the following schedule:

Concrete Pipe Nominal Dia. in Inches	End Section Nominal Dia. in Inches
12	15
18	24
24	30
30	36
36	42
42	48
48	60
54	66
60	72
66	78
72	84

7-02.3(3) Headwalls

If headwalls are specified in the Plans, they shall be constructed as soon as the embankment has been completed to a sufficient height over the Structure to allow the required Work. Headwalls shall be constructed in accordance with applicable portions of Section 6-02.

7-02.3(4) Removing and Relaying Culverts

Where shown in the Plans or where designated by the Engineer, existing culverts shall be removed and relaid in accordance with these Specifications. Any culvert damaged by the Contractor's operations shall be replaced by the Contractor at no expense to the Contracting Agency. In the case of concrete pipe, all joints of the pipe before being relaid shall be cleaned so as to be free from all adhering material, including old mortar placed as a collar or seal in the original construction.

All culvert sections removed and not relaid shall become the property of the Contractor.

7-02.3(5) Safety Bars for Culvert Pipe

When shown in the Plans, safety bars for culvert pipe shall be constructed in accordance with the Standard Plans and shall meet the requirements of Section 9-05.18.

7-02.4 Measurement

The length of culvert pipe or pipe arch will be the number of linear feet of completed installation measured along the invert. Pipe placed in excess of the length designated by the Engineer will not be measured or paid for.

Beveled end sections will be considered as part of the culvert pipe and shall be measured as culverts.

Flared steel and aluminum end sections will be measured by the number of integral units of the dimension specified including toe plate extensions if called for in the Plans.

The pipe connector section of end section Design A shall be fabricated as a part of the integral unit of the end section but will be measured as linear feet of pipe or pipe arch of the treatment, thickness and dimensions of pipe to which it is attached. If there is no Bid item for pipe of the proper dimensions for the end sections, the pipe connector sections will be considered as part of the integral unit and will not be measured as pipe.

Pipe connector sections of end section Design B will be considered part of the integral unit and measurement will be by number of integral units of the type and dimension specified.

The length of safety bars for culvert pipe will be the number of linear feet of each safety bar installed.

Tapered end section with safety bars will be measured by the unit per each.

7-02.5 Payment

Payment will be made in accordance with Section 1-04.1, for each of the following Bid items that are included in the Proposal:

"Schedule ____ Culv. Pipe ____ In. Diam.", per linear foot.

"Plain Conc. Culv. Pipe ____ In. Diam.", per linear feet.

"Cl. ____ Reinf. Conc. Culv. Pipe ____ In. Diam.", per linear foot.

"Plain St. Culv. Pipe ____ In. Th. ____ In. Diam.", per linear foot.

"Tr. ____ St. Culv. Pipe ____ In. Th. ____ In. Diam.", per linear foot.

"Plain St. Culv. Pipe Arch ____ In. Th. ____ In. Span", per linear foot.

"Tr. ____ St. Culv. Pipe Arch ____ In. Th. ____ In. Span", per linear foot.

"Plain Nestable St. Pipe ____ In. Th. ____ In. Diam.", per linear foot.

"Tr. ____ Nestable St. Pipe ____ In. Th. ____ In. Diam.", per linear foot.

"Plain Al. Culv. Pipe ____ In. Th. ____ In. Diam.", per linear foot.

"Plain Al. Culv. Pipe Arch ____ In. Th. ____ In. Span", per linear foot.

"Relaying (type of Pipe and Size)", per linear foot.

"Solid Wall PVC Culv. Pipe ____ In. Diam.", per linear foot.

"Profile Wall PVC Culv. Pipe ____ In. Diam.", per linear foot.

"Corrugated Polyethylene Culv. Pipe ____ In. Diam.", per linear foot.

Where culvert pipes are to be removed but are not to be relaid, all costs in connection with the removal shall be included in the unit Contract price per cubic yard for "Structure Excavation Class B" or "Structure Excavation Class B Incl. Haul".

"Flared End Section ____ In. Diam.", per each.

"Flared End Section ____ In. Span", per each.

"Safety Bars for Culvert Pipe Type ____", per linear foot.

"Tapered End Sect. with Type ____ Safety Bars ____ In. Diam.", per each.